High Performance Computing Simulation and Applied Science in support of GNEP

ADVANCED REACTOR, FUEL CYCLE, AND ENERGY PRODUCTS WORKSHOP FOR UNIVERSITIES

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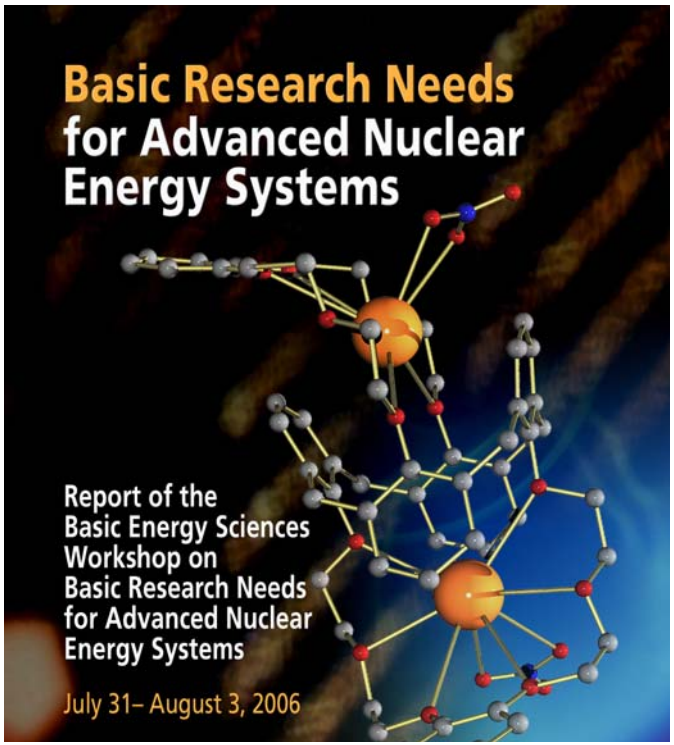
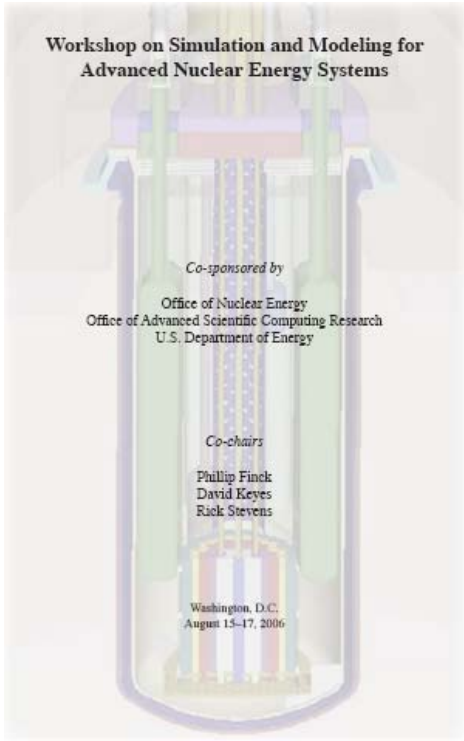
IN 2007 AFCI is starting a new program in Advanced Simulation and computing to establish US leadership in GNEP.

- **The President's Council on Competitiveness recognizes High Performance Computing (HPC) as a strong U.S. competitive advantage to be nurtured and exploited.**
- **GNEP vision is to use the US leadership in simulation, materials science and systems integration to transform the global nuclear energy enterprise.**
- **DOE through Advanced Simulation and Computing (ASC) and Advanced Scientific Computing Research (ASCR) has set the pace for advanced simulation in the world.**

Opportunities for science and simulation in GNEP were developed in three 2006 Office of Science reports





Advanced simulation will be key to meeting GNEP technology needs.

AREAS REQUIRING SIMULATION SUPPORT:

- **Transmutation fuels and performance**
  - Goal to decrease cost and time required through in core irradiation
- **Separations technologies – develop improved separations processes and model scale-up to industrial scale plants**
  - Aqueous
  - Pyro-processing
- **Fast-reactor design (coupled thermal hydraulics, neutronics, materials)**
- **Safeguards – understand, control and track materials flows**
- **Advanced waste forms and repositories**

Crosscutting Issues include:

- **Safety**
- **Nuclear Data requirements**

Key challenges

- **Need**
  - models,
  - simulation codes
  - computational methods
  - Programming and problem set-up tools
  - visualization and analysis tools for large data sets.

- **Must be scalable to 1 - 1,000 petaflops**